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Matrix Product Symmetries and Breakdown of Thermalization

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The presence of unconventional symmetries in quantum systems can result in ergodicity breaking and the prevention of the usual thermalization process. One example is the class of Hilbert space fragmented models which possess an exponentially growing number of kinematically disconnected sectors in the Hilbert space. The phenomenon originates from a symmetry algebra of similarly increasing dimension and can be present in both integrable and non-integrable systems.

In my talk I introduce a mechanism for Hilbert space fragmentation: I present spin chains constructed by hard rod deformation that possess a non-commutative symmetry algebra given by Matrix Product Operators (MPO). As a result, persistent oscillations appear in non-equilibrium situations. Extra symmetries in integrable models are commonly described by MPOs, but in our work we also find non-integrable examples, thus providing a new way of ergodicity breaking.

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